

## PROJECT AUTHORIZATION NO. HWY-2004-07

under

MASTER AGREEMENT FOR RESEARCH AND TRAINING SERVICES BETWEEN THE  
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION AND  
NORTH CAROLINA STATE UNIVERSITY ON BEHALF OF  
THE INSTITUTE FOR TRANSPORTATION RESEARCH AND EDUCATION  
(Contract No. 98-1783)

**Project Title:** Wildlife use of an underpass of the highway 15/501 bridge over Hew Hope Creek

**Formal Statement of Work:** See attached proposal

**Period of Performance:** 1 July 2003 to 30 June 2005

**Budget Authorization:**

Fiscal Year 1	Fiscal year 2	Total
\$73,030	\$48,289	\$121,319

**Property to be Furnished by the Department:** None

**Key Personnel:** P. D. Doerr and R. A. Lancia, Fisheries and Wildlife Program, NCSU

**Project Monitor:** Derry Schmidt, PE

**Additional Terms and Conditions:** Research Project Guidelines as posted on ITRE's website at <http://itre.ncsu.edu/research/ongoingguidelines.htm>.

IN WITNESS WHEREOF, the parties hereto have executed this Project Authorization as of  
\_\_\_\_\_, 2003.

NORTH CAROLINA STATE UNIVERSITY NORTH CAROLINA DEPARTMENT  
OF TRANSPORTATION

BY: \_\_\_\_\_  
Principal Investigator

BY: \_\_\_\_\_

BY: \_\_\_\_\_  
N. C. State University

BY: \_\_\_\_\_  
Director of CTE

BY: \_\_\_\_\_  
Director of ITRE

## PROPOSAL

AMOUNT OF FUNDS REQUESTED: \$121,319

TITLE: Wildlife Use of An Underpass of the 15/501 Highway Bridge Over New Hope Creek

PURPOSE: To document use of the 15/501 bridge underpass by white-tailed deer and other wildlife prior to construction of a new bridge.

NAME AND ADDRESS OF PREPARER:

Dr. Richard A. Lancia, Fisheries and Wildlife Program, Turner House, Box  
7646, NC State University, 27695; richard\_lancia@ncsu.edu

MAJOR SUBDIVISION CONDUCTING WORK:

Fisheries and Wildlife Program, NC State University

PRINCIPAL INVESTIGATORS:

Dr. P. D. Doerr, Fisheries and Wildlife Program, NCSU  
Dr. R. A. Lancia, Fisheries and Wildlife Program, NCSU

DATE: 1 March 2003

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## INTRODUCTION

We propose to compare white-tailed deer use of the current New Hope Creek (NHC) bridge to the proposed new bridge, which has been designed to facilitate deer use of the underpass. Documenting the efficacy of the proposed bridge is important to NC DOT to justify construction costs to the public. It is also important to a larger audience because there is no documentation, that we are aware of, to justify demands to build bridges to facilitate use by wildlife and to reduce deer-vehicle accidents.

## BACKGROUND

The NC Department of transportation is planning to replace the current bridge over New Hope Creek (NHC) on US Highway 15-501 between Chapel Hill and Durham. The preferred alternative calls for dual bridges 205 feet long, which would provide about 50-60 feet on each side of the creek for a wildlife crossing and a greenway trail. The wildlife crossing would accommodate animals as large as white-tailed deer.

## PROBLEM OR NEED DEFINITION

The need is to determine the degree to which deer and other wildlife will use the existing and proposed bridge.

## RESEARCH OBJECTIVES

1. Document wildlife use of the current bridge.
2. Develop an index of deer abundance so that use of the current and proposed bridge can be compared, i.e., deer use can be standardized to the same relative deer abundance.
3. Document the frequency of deer-vehicle accidents between Mt. Moriah Road and Garrett Road.

## LITERATURE OF RESEARCH REVIEW

White-tailed deer would be expected to use the NHC underpass because forests associated with the creek provide a corridor between Duke Forest and Jordan Lake. Most use would be expected in the fall during the rut, because this is the period when yearling males disperse. Rosenberry et al. (2001) described dispersal movements and behavior for yearling bucks in Maryland and would provide a comparison for results from this proposed study.

Dr. Paul A. Garrett (Purpose and need statement, design consideration, upgrade corridor, NC DOT Concurrence Meeting, 8 November 2001) analyzed the wildlife crossing requirements of the proposed improvement of US 15-501 from Mt. Moriah Road to Garrett Road between Durham and Chapel Hill. His assessment was that white-tailed deer are very adaptable to urban environments and will move through underpasses. The degree of “openness,” which is calculated as the ratio of the area of the underpass opening to its length, apparently affects the use of an underpass by deer. A ratio of 2.0 (English units) was sufficient

to allow deer to use an underpass. Clevenger and Waltho (2000) evaluated 11 structures and found an inverse ratio between “willingness” to use and underpass and the openness ratio. Thus, larger openings relative to the length of the underpass might be less suitable for deer use. The current bridge over NHC has a openness ratio of about 14.5 and is currently being used by deer (Doerr and Lancia, personal observations, Garrett (2001)). Whether the proposed bridges, which would have an even higher openness ratio, would be used by deer needs to be determined.

A recent study of deer-vehicle accidents in an urban environment found that two landscape characteristics most influenced the number of accidents: (1) number of buildings had a negative affect and (2) patches of public land had a positive effect (Nielsen et al. 2003). Most of the public lands were forested. Thus, the forested greenway corridor associated with NHC would be expected to be an area of high deer-vehicle accidents. The authors recommend “...that communities consider underpasses placed in natural corridors to minimize [deer vehicle accidents]....” (Nielsen et al 2003:50).

## RESEARCH METHODOLOGY AND TASKS

1. Wildlife use will be documented in several ways. (a) A digital video camera surveillance system will be installed. The system will consist of four ultra low light cameras and four IR spotlights on each outside corner of the existing bridge. This setup will allow 24-hour monitoring of deer use, as well as smaller mammals and perhaps birds and other species. The cameras will be wired to a digital video recorder (DVR) hidden on the site. Up to 2.1 hours of 5 frame per second digital video is stored per Gbyte. A 20 Gbyte disk will be used to store about 40 hours of continuous recording per disk. Two 20 Gbyte drives will allow swapping of disks in the field. Another DVR in the lab, connected to a Macintosh G-4 setup for digital video processing, will be used to review the images. Behaviors of animals will be grouped into categories such as hesitation, avoidance, passage, etc. Statistical programs will be developed to quantify rates of use. (b) Track counts will be made weekly. Appropriate areas will be cleared of old tracks, and the species, direction, and number of new tracks will be recorded. Data will be summarized by week, species and direction, as is appropriate. (c) Every other week, except during the rut when observations will be weekly, visual observations from a blind will be made. Data will be use to corroborate the video cameras.
2. Deer use of the underpass is a function of both the “willingness” of deer to use the underpass and deer abundance. The former will be documented in research methodology number 1 above. The latter will be assessed by reviewing NC Wildlife Resources Commission abundance estimates and harvest data and by examining DOT roadkill data.
3. Data on deer-vehicle accidents along 15-501, and several other roads across NHC for comparison, will be gathered from DOT historical records. During the study these roads will be checked weekly for signs of deer-vehicle accidents. DOT road crews will be asked to notify us of all deer-vehicle accidents along these roads.

## SIGNIFICANCE OF PROPOSED WORK

The significance of the proposed work is that the study can be repeated when the proposed bridge is completed. Then, the efficacy of the new, longer bridge as a wildlife crossing can be quantitatively assessed.

## IMPLEMENTATION AND TECHNOLOGY TRANSFER PLAN

Results of this study will be published in appropriate professional outlets. Presentations to interested publics and the media will be given.

## PROPOSED WORK SCHEDULE

The study will continue for two years, unless construction activities interfere with data collection, at which time the project authorization will be revised to reflect the reduced scope of work.

Dates	Activity
Summer 2003	Acquire and setup DVR Begin monitoring
Fall 2003	Intensify monitoring during rut Review DVR images
Winter 2003, spring, summer 2004	Continue monitoring Review DVR images
Fall 2004	Intensify monitoring during rut Review DVR images
Winter 2004, spring 2005	Complete monitoring Finish theses

## REFERENCES

- Clevenger, A.P, and N. Waltho. 2000. Factors influencing the effectiveness of wildlife underpasses in Banff National Park, Alberta, Canada. *Conservation Biology* 14:47-56.
- Nielsen, C. K, R. G. Anderson, and M. D. Grund. 2003. Landscape influences on deer-vehicle accident areas in an urban environment. *The Journal of Wildlife Management* 67:46-51.
- Rosenberry, C. S., M. C. Conner, and R. A. Lancia. 2001. Behavior and dispersal of white-tailed deer during the breeding season. *Canadian Journal of Zoology* 79:171-174.

## BIOGRAPHICAL DATA

### **RICHARD A. LANCIA**

Coordinator, Fisheries and Wildlife Program  
Box 7646, North Carolina State University  
Raleigh, NC 27695-8002  
919-515-7586(w); 919-380-0029(h)  
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#### **Experience:**

Professor, Department of Forestry, NCSU, 1990 to present  
Associate Professor, Department of Forestry, NCSU, 1985  
Visiting Assoc. Prof., Dept. of Forestry and Res. Mgt., UC Berkeley, 1985  
Assistant Professor, Department of Forestry, NCSU, 1979  
Associate Appointment, Department of Zoology, NCSU, 1979 to present  
Instructor, Department of Forestry, NCSU, 1978

#### **Courses Taught:**

FW(ZO)553 Techniques of Wildlife Management, fall, 1998  
FOR(261) Forest Wildlife (summer 1 credit), 1995 to present  
FOR(110)/NR(100) Intro Forestry/Natural Resources, 1994-1995  
FOR 691 Forestry Graduate Seminar, 1991-92  
FW(FOR)602 Wildlife Management Seminar, 1986 to present  
FORESTRY 170 Wildlife Ecology (at Berkeley), fall, 1985  
FORESTRY 270 Wildlife Ecology Seminar (at Berkeley), fall, 1985  
FW(FOR)404 Forest Wildlife Management, 1979 to present  
FW(FOR)310 Fisheries and Wildlife Inventory and Mgt., 1979 to present

#### **Education:**

University of Massachusetts, Wildlife Biology, Ph.D. (1979)  
Southern Illinois University, Zoology, M.A. (1974)  
University of Michigan, Wildlife Management, B.S. (1968)

#### **Selected Recognitions:**

NCSU Alumni Distinguished Professor (1995-96, 1996-97)  
NCSU Outstanding Teaching Award, College of Forest Resources, 1992-93  
Outstanding Achievement Award - University of Massachusetts, 1978  
Phi Kappa Phi (1974, Academic)  
Superior Achievement - Field Artillery Officers Basic Course, USMC, 1969  
Superior Achievement - The Basic School, USMC, 1968 (7th of 245)

#### **Selected Professional Activities:**

The Wildlife Society  
National - Southeastern Section Representative to TWS Council 2000-03

Southeast Section - President, 1998-99

North Carolina Chapter - President, 1986-87

North Carolina State University:

Director of Undergraduate Programs, Dept. of Forestry, 1994-1997

Chairman, Academy of Outstanding Teachers Executive Council,, 1995-96

Sigma Xi North Carolina State University Chapter - President, 1990-91

Director, The University Honors Council, 1991-92

Editorial Duties:

Editor in Chief, The Journal of Wildlife Management, 1990-91

### **Publications (65 publications prior to 1999; selected 1999 to date listed)**

- Lancia, R. A., C. S. Rosenberry, and M. C. Conner. 1999. Population parameters and their estimation. Pages 64-83 in Ecology and management of large mammals in North America. S. Demarais and P. R. Krausman, editors. Prentice Hall, NJ. 778pp.
- Rosenberry, C. S., R. A. Lancia, and M. C. Conner. 1999. Population effects of white-tailed deer dispersal. Wildlife Society Bulletin. 27:858-864.
- Tardiff, J., R. A. Lancia, and M. C. Conner. 1999. White-tailed deer use of clover patches and soybean fields in an agricultural area. Proc. Southeast. Assoc. Fish Wildl. Agencies. In Press.
- Davenport, D. E., R. A. Lancia, J. R. Walters, P. D. Doerr. 2000. Red-cockaded woodpeckers: A relationship between reproductive fitness and habitat in the North Carolina Sandhills. Wildlife Society Bulletin. 28:426-434.
- Rosenberry, C. S., M. C. Conner, and R. A. Lancia. 2001. Behavior and dispersal of white-tailed deer during the breeding season. Canadian Journal of Zoology 79:171-174.
- Mitchell, M. S., R. A. Lancia, and J. A. Gerwin. 2001. Using landscape-level data to predict the distribution of birds on a managed forest: effects of scale. Ecological Applications. 11:1692-1708..
- Wigley, T. B., M. S. Mitchell, P. C. Van Deusen, and R. A. Lancia. 2001. Tools for blending economic and ecological objectives on private forestlands. Trans. N. Amer. Wildl. and Nat. Resour. Conf. 66:61-76.
- Nichols, J. D., R. A. Lancia, and J. D. Lebreton. 2001. Hunting statistics: What data for what use? An account of an international workshop. Game and Wildlife Science (Gibier Faune Sauvage): 18(2):185-205.
- Turner, J. C., R. A. Lancia, and J. A. Gerwin. 2002. Influences of hardwood stand area and adjacency on breeding bird communities in an intensively managed forest landscape in the Lower Coastal Plain of South Carolina. Forest Science 48:323-330.

### **Presentations - 40 abstracts and oral papers**

### **Research Grants - 1 million for career**

**Principal Leisure Interests:** Family, avid fisherman, some deer hunting, antique 1951 Chevrolet truck, lake house and water recreation.